

Conference Paper

Innovation of a Grinder Machine for Improvement of Waste Treatment for Craftsmen at Mayong Lor Village, Jepara

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Mayong Lor Village has superior regional products in the form of pottery crafts, such as traditional children's toys, jars, and others. Other clay-based businesses include producing roof tiles, wuwung and bricks. The main problem for craftsmen is the amount of waste that has not been processed well. Craftsmen are accustomed to treating waste traditionally. Therefore there is a need for a crusher or grinder that can be used to crush waste into finer flakes quickly and easily. The stages used in manufacturing the machine are field observations and reviews, designing machine prototypes, identifying product specifications, and manufacturing and testing grinder machines. The results found that the grinder machine with dimensions of 90 x 50 x 120 with 24 beaters, 5 frames, 3mm tubes and 1.6 mm funnels. This engine is driven by an 8hp diesel drive. This machine can be used easily by craftsmen to treat waste in the form of fine powder.

Keywords: grinder machine, waste treatment, earthenware, roof tiles, bricksCorresponding Author: Jayanti Putri Purwaningrum; email: jayanti.putri@umk.ac.id**Published** 21 December 2022

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1. Introduction

Jepara Regency is a regency in Central Java Province that administratively has a land area of about 1,004,13 km² with 16 sub-districts, 184 villages and 11 urban villages and a sea area of 2,112,836 km². Topologically, Jepara Regency is located with coordinates 110°9'48,02" – 110°58'37,40" East Longitude 5°43'20,67" – 6°47'25,83" South Latitude, with territorial boundaries covering the west and north are the Java Sea, east of Pati and Kudus regencies, while in the south are Demak regencies.

Jepara Regency is not only famous for its beautiful natural charm but also has a variety of excellent potential. The torso carving and weaving craft industry is one of Jepara Regency's creative industries that has been recognized worldwide. One of the other superior products from Jepara Regency is pottery. Mayong Lor Village in Mayong

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District, Jepara Regency is a creative industry center village with the main ingredients in the form of clay in the form of jars, jugs, traditional children's toys for remittances, piggy banks, tiles, bricks, wuwung, and so on. The creative industry made from clay in Mayong Lor Village has existed for a long time and is a legacy of local ancestors from generation to generation. Because it is a legacy, the crafts of pottery, tiles, and bricks in Mayong Lor Village continue to be preserved, and even most of the livelihoods of the people in the village are pottery producers.

In the clay industry, quality is a significant concern. The craftsmen sort the work that is not good, or there are cracks in the combustion process. Cracks during production are considered defects. These fractions by the Javanese people are called *kreweng*. Defective pottery is considered unfit for sale. The defective pottery is usually only left to pile up beside the craftsmen's yard, dumped on the edge of the village, and on the streets so that it disturbs the environment. Waste that is allowed to accumulate will cause negative and detrimental effects. The environment not only looks shabby, but can also be a breeding ground for mosquito larvae. The number of pottery craftsmen in Mayong Lor Village resulted in more and more waste generated from broken pottery, tiles, and bricks. The following Figure 1 is an overview of the waste generated by the craftsmen.



Figure 1: Waste of Pottery, Tile, and Brick.

This highlights the main problem of craftsmen where they cannot process production waste optimally. Craftsmen are traditionally used to processing waste pottery, tiles, and

bricks by hand, so it takes time and effort. This method can be done when the treated waste is only on a small scale. However, if the scale is large, the manual method is not effective and efficient because it takes a long time, requires more energy and the results are also not optimal. This is the same as research on the manufacture of corncob waste crushing machines which states that using machines on large-scale waste is faster and easier (1). Therefore we need a crushing machine or grinder that can be used to crush waste pottery, tiles, and bricks into finer flakes quickly and easily. Thus, waste treatment becomes effective and efficient. The way to treat waste is by crushing it using a bat or *hammer* which is quite a lot according to capacity and is inserted into modern machines. A dynamic hammer works by rotating on an axis or shaft to help destroy waste so that the process is faster until the waste is crushed into smaller particles such as powder or powder according to the size of the filter.

Waste treatment that is not fast and precise will create serious problems where the amount of waste will increase yearly. The results of processing waste from broken pottery, tiles and bricks in the form of powder can be used by craftsmen as a mixed material in the manufacture of new pottery so that it is smoother and less hollow and adds to the aesthetics of ceramics as high-value works of art (2). Thus, the right manufacturing method is the main key in the success of making clay-based works (3).

In order to assist the development of clay-based creative industries in improving the quality and quantity of products, various efforts are required. These efforts include improving the production process, by applying appropriate and targeted technology in the form of tools or grinder machines to facilitate the production of creative clay-based products such as piggy banks, jars, bricks, wuwung, roof tiles and others.

2. Method

The flow chart for the stages of making the grinder machine is shown in Figure 2 below.

The steps for making a grinder machine are a modification of the activities carried out by Burlian et al. (4) The design of a grinder machine to improve the processing of pottery, tile, and brick waste for use by the craftsmen of Mayong Lor Village is supported by various well-planned components. This is expected to run well and avoid failure during operation. The following Figures 2 and 3 are sketches of 2-dimensional and 3-dimensional grinding machines.

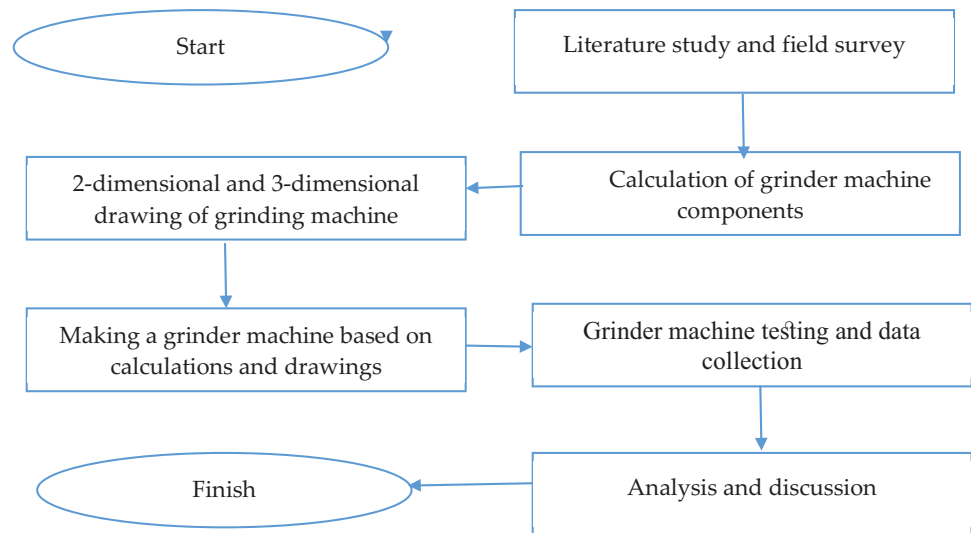


Figure 2: Flowchart of the Stages of Making a Grinder Machine.

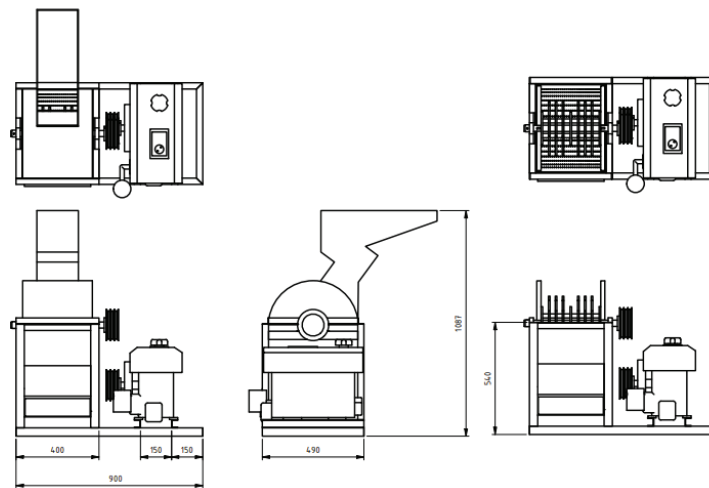


Figure 3: Sketch of a 2-Dimensional Grinder Machine for Processing Pottery, Tile, and Brick Waste.

3. Result and Discussion

After the manufacture, the next process is to carry out tool testing activities by entering the waste of pottery, tile and brick fragments into the grinder machine with a focus on testing the results of powder or flakes produced from waste milling. Testing on a tool or machine is carried out to find out whether the machine made can function properly by the criteria, timeliness and planned results (5).

The following Figure 5 is a picture of the grinder machine that has been made.

The specifications of the grinder machine are as follows.

1. Dimensions : 90*50*120cm

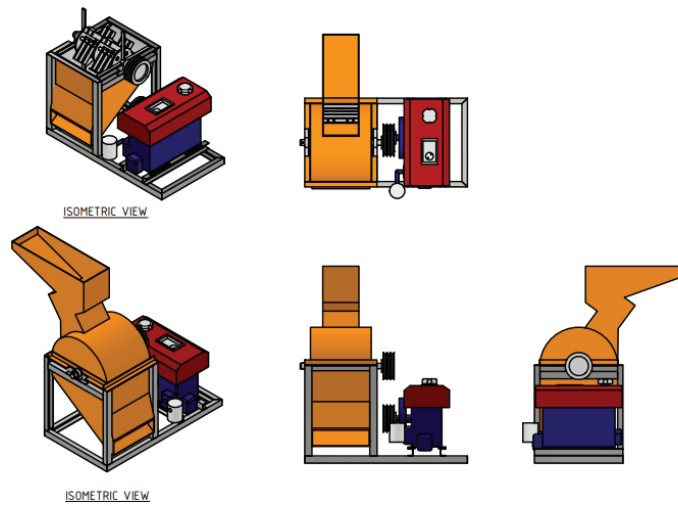


Figure 4: Sketch of a 3-Dimensional Grinder Machine for Processing Pottery, Tile, and Brick Waste.



Figure 5: Machine Pottery, Tile, and Brick Waste Processing Grinder.

2. Beaters : 24 pieces

3. Machine body : Unp 5 frame
4. Tube : 3mm
5. Funnel : 1.6 mm
6. Diesel drive : 8 hp
7. Filter hole : 5 mm
8. Mesh size : 5mm
9. Hooper in : iron plate
10. Bearings : 1 pair type 208
11. Engine shaft : axle 38 iron
12. Outlet : iron plate
13. V-belt : 1 piece

The way the machine works is using a hammer or hammer system. The hammer that rotates with the shaft will hit the chunk repeatedly. The results obtained are influenced by the installed and replaced filters as needed. The working mechanism of the grinder machine is as follows.

1. When the main drive motor (diesel motor) is turned on, the pulley on the main drive motor rotates and transmits rotation to the pulley on the hammer mill machine through the v-belt.
2. The pulley on the *hammer mill machine* then rotates the engine shaft on the dynamic hammer
3. The waste of pottery, tile and brick shards enters through the hooper and then shyly works to destroy the waste
4. A perforated filter plate will filter the processed powder
5. The powder will pass through the filter device and exit through the outlet

The working principle of the hammer mill is that the inserted material will be crushed by the hammer, passing through the gap between the hammers and "landing" on the sieve. Material with a size smaller than the filter hole will come out as a product while the larger material will be carried away again by the hammer so that a further pounding process occurs (6).

The existence of a grinder machine makes the waste treatment process faster and easier. Based on the analysis of the engine performance, broken pottery, tiles and bricks are crushed into a soft powder. In 1 hour the grinding machine can crush up to 0.5 cubic meters of waste material . This is influenced by the selection of speed on the machine. Furthermore, the resulting powder is used by craftsmen as a mixture of additives to make clay-based crafts. This is in accordance with Setyati's statement that an improvement in the production process makes production activities more effective and efficient (7,8).

4. Conclusion

The suggestions that can be used for further researchers are the level of accuracy in the manufacture of machines as well as a place that can be used as a container for powder from the waste treatment process. The conclusion that can be drawn is that the design carried out is in accordance with the needs of the partners of clay-based craftsmen, namely the grinder machine which is used as a waste processor for pottery, tile and brick shards. The way the machine works is not too complicated.

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